

without further reference to the chemical questions involved.

Again, a brief discussion of the Liesegang rings obtained when silver nitrate diffuses into gelatin containing potassium bichromate (p. 43), is made the starting-point for many suggestions as to the significance of these phenomena in explaining stratification in structural features of the cell and even of tissues. In view of our lack of information as to these diffusion phenomena, little significance can attach at present to the analogous appearances in cell structures referred to by the author.

The physical properties of protein sols and gels are discussed without reference to the reaction of the solution or the iso-electric point of the protein, the fundamental papers published by Jacques Loeb being ignored. Swelling and imbibition remain, therefore, very incompletely treated, and the interesting American work upon the importance of pentosans in the retention of water by plant mucilages is also neglected. The author refers, however, in his preface to the continued post-war difficulty in obtaining access to foreign literature, and doubtless these sections will undergo modification in a later edition.

The subsection upon enzyme action shows a similar lack of arrangement. It is to be hoped that the author's endorsement of Euler's suggestion that when enzymes are active as catalysts during synthesis they should be denoted by the suffix "*ese*," will not lead to an extension of the practice. His discussion of enzymes in relation to metabolic synthesis is unsatisfactory, but it at least makes clear how little reason there is for such a practice. Without a clear discussion of modern views of the stereo-chemistry of the hexoses, the discussion of the catalytic action of maltase and emulsin during synthesis is necessarily difficult, but it is curious to find no mention of the experiments of Bourquelot and Bridel, which had reached an interesting stage even in pre-war days. An interesting discussion of the action of hormones in relation to stimulus and response appears in this subsection upon enzymes. The subject reappears in a later section under the heading of response to stimulus, and here reference is made to the work of Paal, Ricca, and others, the absence of which in the earlier discussion had aroused surprise.

The attempt made to base the phenomena of stimulus and response upon physico-chemical phenomena provides some of the most interesting reading of the book, but it would appear hopeless to expect success in such an effort when the subject of the quantitative study of growth rate is compressed into less than two pages at the end of this section.

Scientific Management of Farming.

- (1) *Farm Management: A Text-book for Student, Investigator, and Investor.* By Prof. R. L. Adams. (Agricultural and Biological Publications.) Pp. xx+671. (New York and London: McGraw-Hill Book Co., Inc., 1921.) 20s.
- (2) *Organised Produce Markets.* By Prof. John George Smith. Pp. ix+238. (London: Longmans, Green and Co., 1922.) 12s. 6d. net.
- (3) *Agricultural Co-operation in England and Wales.* By W. H. Warman. Pp. xi+204. (London: Williams and Norgate, 1922.) 5s. net.
- (4) *Rural Organization.* By Prof. W. Burr. Pp. xiv+250. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1921.) 12s. net.

THE volumes before us emphasise the fact that farming involves two distinct kinds of operation, the production of crops and animals, and the marketing of the resulting commodities. Scientific investigators have in the past confined themselves almost exclusively to production, this being the side that involves the soil, the growing plant and the living animal, and with these almost all the sciences at present studied; it is quite evident, however, that there is a wide field for the economist in the marketing problems that will amply repay study.

(1) Prof. R. L. Adams deals exclusively with American conditions; his book is of a type that is not produced in this country, the old Fream in the past and some of the Oxford publications in the present being our nearest approach to it. It covers the whole range of the farm activities, largely from the economic side, but with constant references to modern improvements in production and the scientific principles on which they are based.

A great advantage of the book is the generous provision of tables of data showing crop yields, costs of production, effects of various factors on costs, on income, etc., with references to the original sources which will be at least equally appreciated. It is these data and references which give the book a special value to the teacher in this country, for he is thus enabled to ascertain how the values have been arrived at and how far they can help him in his work.

(2) Prof. J. G. Smith, of the Faculty of Commerce in the University of Birmingham, sets out in his book the general characteristics of organised markets and the broad principles involved in marketing operations. Considerable space is devoted to wheat and large-scale buying operations are discussed in detail. The volume is of interest as showing the extraordinary complexity of the processes whereby wheat is transferred from the Canadian farm to the English consumer.

(3) Major Warman deals more narrowly with the agriculturist and is concerned with an account of agricultural co-operation in England and Wales. He is convinced that co-operation is essential to the success of agriculture, and he is able to show that it is beginning to take hold on the rural community. Examples are given of farming societies, egg societies, dairy societies, etc., which are doing good work and have an undoubted future: we should, however, like to have seen some tables showing the amounts of produce handled, the financial turnover, etc. It may be the amounts are not large, but it is desirable that the data should be published.

(4) Prof. W. Burr discusses a wider problem, the organisation of the whole rural community in contradistinction to the urban population. It is widely recognised by American writers that the urban and rural communities are distinct, having different needs and requiring different methods of organisation. In this country the rural organisation has grown up through long ages and the urban population is the new problem: in America, however, the rural community is also new, and experts are studying closely the method in which it has developed, and feeling their way to some new organisation. The book is written for students, and it includes lists of questions and "research problems," which space, however, might usefully have been devoted to references to help those who wish to pursue the study of this interesting subject.

An Ideal Text-book of Physics.

Cours de physique générale à l'usage des candidats au certificat de Physique générale, au diplôme d'Ingénieur-Électricien et à l'Agrégation des Sciences physiques.

Par Prof. H. Ollivier. Tome Second: Thermodynamique et Étude de l'Énergie rayonnante. Deuxième édition, entièrement refondue. Pp. 415. (Paris: J. Hermann, 1922.) 28 francs net.

FEW examination candidates are likely to base their studies on a book in a foreign language adapted to foreign courses; and it is therefore unnecessary to consider here the merits of this work for the purpose for which it is primarily intended. It will suffice to say that none but the ablest students could master it unaided. But as an exposition of the fundamental propositions of mathematical physics, from which those of us who have passed the examination stage may refresh our memories concerning what we once knew, or were officially credited with knowing, the volume exhausts our vocabulary of praise. There are no native works which profess to cover the same range, and few of any merit which cover part of it.

We usually rely on Winkelmann or Chwolson. The former is far more encyclopædic, the latter more experimental; for M. Ollivier gives very few references and only such experimental facts as are necessary to illustrate principles; but in conciseness, lucidity and accuracy they are not to be mentioned in the same breath with our author. Even in completeness he is sometimes superior, for he enters more fully than most authors into some interesting byways of physics, such as luminescence, photometry and astrophysics.

The treatment is at once original and conservative. The order of historical development is usually abandoned completely and the subject developed in the full light of our present knowledge. Consequently, the science is presented deductively rather than inductively, the most general principles being stated first and their most important logical consequences (which are of course really their basis) gradually worked out. Whether this reversal of the usual sequence is desirable in teaching may perhaps be questioned, but there is no doubt of its efficacy in summarisation. On the other hand, there are no signs of the modern tendency to seek principles so broad and far-reaching that in gaining generality they almost lose physical significance. Thus the Boltzmann conception of entropy as probability appears only towards the end of the exposition of thermodynamics and the Nernst theorem appears mainly in foot-notes. But there is nothing old-fashioned about the book; if the author does not always pay so much attention as some would wish to the latest work, the reason is clearly a deliberate judgment of value and not mere ignorance.

But M. Ollivier's supreme merit in our eyes is that he really does write about mathematical physics. He does not give us either a treatise on pure mathematics which neglects the distinction between experiments which can, and those which cannot, be carried out, or a mere collection of familiar formulæ with "proofs" which prove nothing but the author's incapacity for accurate thought. He actually tells us how important magnitudes are measured and what is implied by the fact of their measurement; he realises that to define a magnitude and to say how it is measured are one and the same thing. Yet he does not fall into the opposite vice and weary us with needless pedantry; many readers will probably appreciate his abandonment of the old inadequacies and inaccuracies only by finding that, for the first time, they truly understand.

However, it is needless to continue in this strain. The present reviewer is not acquainted with the first volume of M. Ollivier's work and must confess that he had never heard of the work until it came into his hands for review. Many others are probably in a similar state of ignorance. The best that he can wish